

CLAIMS:

- 1.** An isolated nucleic acid molecule encoding fungal immunomodulatory protein comprising a nucleic acid sequence as follows:

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ATGTCTGATA CTGCTTTGAT TTTCAGATTG GCTTGGGATG TTAAGAAGTT GTCTTCGAT TACACTCCAA  
ACTGGGGTAG AGGTAACCCA AACAACTTCA TTGATACTGT TACTTTCCA AAGGTTTGAT CTGATAAGGC  
TTACACTTAC AGAGTTGCTG TTTCTGGTAG AAACCTGGGT GTTAAGCCAT CTTACGCTGT TGAATCTGAT  
GGTTCTCAAAGGTTAACCTT CTTGGAATAC AACTCTGGTT ACGGTATTGC TGATACTAAC ACTATTCAAG  
TTTCGTTGT TGATCCAGAT ACTAACAAACG ATTTCATTAT TGCTCAATGG AACTGA
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- 2.** The isolated nucleic acid molecule according to Claim 1, which is ligated to other gene to be expressed in one delivery system.
- 3.** An expression vector comprising the nucleic acid molecule according to Claim 1.
- 4.** An expression vector comprising the ligated nucleic acid molecule according to Claim 2.
- 5.** A host cell that is transformed with the vector according to Claim 3 or Claim 4.
- 6.** The host cell according to claim 5 that is a bacterium, a fungal cell or a yeast cell.
- 7.** The host cell according to Claim 5, that is *Saccharomyces cerevisiae*, *Pichia pastoris*, *Hansenula polymorpha*, *Candida utilis*, *Candida boidinii*, *Candida maltosa*, *Kluyveromyces lactis*, *Yarrowia lipolytica*, *Schwanniomyces occidentalis*, *Schizosaccharomyces pombe*, *Torulopsis*, *Arxula adeninivorans*, or *Aspergillus* (*A. nidulans*, *A. niger*, *A. awamori*, *A. oryzae*) or *Trichoderma* (*T. reesei*).
- 8.** The host cell according to Claim 5, wherein the yeast is *Saccharomyces cerevisiae*.
- 9.** The host cell according to Claim 5, which is in intact or disrupted form.
- 10.** The host cell according to Claim 5, which can secrete the protein of the invention.
- 11.** The host cell according to Claim 5, which is administered to a subject selected from the group consisting of mammal, fish, crustacean and poultry.
- 12.** The host cell according to Claim 11, wherein the administration is by the route selected from the group consisting of i.v., i.p, oral, mucosa, skin adsorption or immersing in solution.
- 13.** The host cell according to Claim 11, wherein the administration is by the oral route.

- 14.** The host cell according to Claim 11, wherein the mammal is pig and the poultry is chicken.
- 15.** The host cell according to Claim 11, wherein the fish is grouper, salmon or trout.
- 16.** The host cell according to Claim 11, wherein the crustacean is shrimp, lobster, *Penaeus monodon*, *Penaeus japonicus* or *Penaeus vannamei*.
- 17.** A process of expressing protein in a host cell with fungal immunomodulatory protein, the process comprising (a) constructing an expression vector having the FIP nucleotide sequence that the host cell preferred inserted, (b) transforming a host cell with the vector; and (c) culturing the host cell under appropriate conditions for expression.
- 18.** The process according to Claim 17, wherein the improved FIP nucleotide sequence is nucleic acid sequence of Claim 1.
- 19.** The process according to Claim 17, wherein the host cell in step (a) and (b) is *Saccharomyces cerevisiae*.
- 20.** The process according to Claim 17, wherein the vector in step (b) is pYB101-FIP-yeast.
- 21.** The fungal immunomodulatory protein prepared by the process of Claim 17, and the fungal immunomodulatory protein isolated from the host cell transformed by the process of Claim 17.
- 22.** A process of purifying FIP from the said host cells transformed with the said vector, the process comprising:

 - (a) dissolving fermented host cells in a solvent;
 - (b) disrupting cells,
 - (c) modify the pH of the solution to pH 4-5;
 - (d) separating debris in the cell extracts;
 - (e) centrifuging the supernatant;
 - (f) adding the supernatant to the column equilibrated to pH 4-5; and
 - (g) eluting the Ling Zhi immunomodulatory protein.
- 23.** The process according to Claim 22, wherein the Ling Zhi immunomodulatory protein is eluted by adding 20-50mM acetic acid at pH 4-5.
- 24.** A composition for use in modulating immunological activities by oral route comprising fungal immunomodulatory protein.

25. The composition according to Claim 24, wherein the fungal immunomodulatory protein is prepared from natural Ling Zhi or from the fungal immunomodulatory protein of Claim 21.
26. The composition according to Claim 24, which is applied to cosmetic use to reduce inflammation and anaphylaxis.
27. The composition according to Claim 24, which is applied to pharmaceutical use for reducing inflammation and anaphylaxis, modulating immunological activity, preventing diabetes, improving asthma, increasing response against bacterial and viral infection and decreasing immunological response against organ transplantation.
28. The composition according to Claim 24, which is applied to food or feed additives for lengthening life, modulating immunological activity, increasing feed conversion and decreasing stress.
29. A method of modulating immunological activities comprising orally administering fungal immunomodulatory protein or protein fused with FIP to a subject.
30. The method according to Claim 29, wherein the protein is prepared from *E.coli* or *Saccharomyces cerevisiae*.